PATENT ABSTRACTS OF JAPAN

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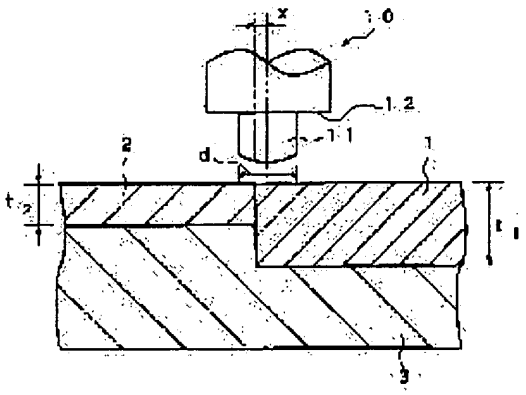
(54) JOINING METHOD FOR DIFFERENT THICKNESS JOINT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a joining method for a different thickness joint by which a joint having high strength is obtained by friction stir welding.

SOLUTION: An aluminum alloy plate 1 and an aluminum alloy plate 2 are provided by butting on a surface plate 3 in which a difference in level is provided. A height of the difference in level which is provided in the surface plate 3 is designed so as to coincide with a difference in the plate thickness between the aluminum alloy plates 1 and 2, the aluminum alloy plate 1 is provided in the lower side of the difference in level and the aluminum alloy plate 2 is provided in the upper side of the same, surfaces of the aluminum alloy plates 1 and 2 are formed into a uniform height by providing the aluminum alloy plate 2 in the upper side, and one plane is formed. Next, a tool 10 for FSW is rotationally press fitted into a place which is shifted to the aluminum alloy plate 1 side from the butting part of both aluminum alloy plates 1 and 2 as aiming position of the pin part 11, and friction stir welding is performed so that it traverses the aluminum alloy plates 1 and 2.



LEGAL STATUS

[Date of request for examination]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, although friction churning junction is a suitable approach for board thickness to perform fill penetration junction in the butt joint of equal plates Although friction churning junction is enabled by devising the configuration of a surface plate (backing strip) 3 by the above conventional junction approaches, about the other conditions Since board thickness is almost the same as that of friction churning junction of equal plates, the unsealed section remains in the rear-face side of a joint, and there is a trouble that it is difficult to obtain reinforcement sufficient as a joint.
[0009] This invention is made in view of this trouble, and it aims at offering the junction approach of a difference thickness joint that the joint of high reinforcement can be obtained by friction churning junction.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the junction approach of a difference thickness joint of having aimed at reduction of the defect in the comparison section especially, about the junction approach of a suitable difference thickness joint to join the members from which thickness differs like the interior panel of an automobile.
[0002]
[Description of the Prior Art] The method of manufacturing the difference thickness joint of sheet metal is put in practical use about the steel plate by comparing the end face of two plates and joining. For example, laser welding is adopted as junction. The member of such a configuration is called tailored blank material.
[0003] On the other hand, in the panel of an automobile etc., the shift to an aluminium alloy plate from a steel plate from a viewpoint of lightweight-izing is considered. The thing suitable as an aluminium alloy for tailored blank material is JIS with high reinforcement with a good and moldability. Although it is a 6000 system alloy, if melting welding of arc welding, laser welding, etc. is performed to this alloy plate, it will become easy to produce a crack in a heat affected zone and the weld metal section.
[0004] The method of manufacturing a jointing material for corrugated fibreboard is indicated by JP,2000-167676,A by comparing the end face of two aluminium alloy plates, and performing friction churning junction (FSW) there. Thus, the manufactured jointing material for corrugated fibreboard is processed into a specific member configuration by press forming, after being unified by junction.
[0005] Drawing 2 is the sectional view showing the junction approach indicated by JP,2000-167676,A. By the approach indicated by this official report, the aluminium alloy plate 1 and the aluminium alloy plate 2 are first compared and installed on the surface plate 3 with which the level difference was prepared. Here, it considers as what has the thickness of the aluminium alloy plate 2 thicker than that of the aluminium alloy plate 1. By designing the height of the level difference prepared in the surface plate 3 so that it may be in agreement with the board thickness difference of the aluminium alloy plates 1 and 2, installing the aluminium alloy plate 1 in the level difference bottom, and installing the aluminium alloy plate 2 in the bottom, the front face of the aluminium alloy plates 1 and 2 comes to come to the height of homogeneity, and one flat surface is formed.
[0006] Subsequently, it presses fit as an aim to which the point of the pin section 11 of the tool 10 for FSW hits the comparison section of both the aluminium alloy plates 2 and 3, rotating the tool 10 for FSW, and friction churning junction is performed.
[0007] It can apply also to the charge of a refractory tie, and such a junction approach is JIS. It is suitable for the joint of a 6000 system alloy plate.
[0008]
[Problem(s) to be Solved by the Invention] However, although friction churning junction is a suitable approach for board thickness to perform fill penetration junction in the butt joint of equal plates Although friction churning junction is enabled by devising the configuration of a surface plate (backing

strip) 3 by the above conventional junction approaches, about the other conditions Since board thickness is almost the same as that of friction churning junction of equal plates, the unsealed section remains in the rear-face side of a joint, and there is a trouble that it is difficult to obtain reinforcement sufficient as a joint.

[0009] This invention is made in view of this trouble, and it aims at offering the junction approach of a difference thickness joint that the joint of high reinforcement can be obtained by friction churning junction.

[0010]

[Means for Solving the Problem] The junction approach of the difference thickness joint concerning this invention is characterized by to have the process which arranges the location of the front face and compares the aluminum or the aluminium alloy plate which is two sheets from which thickness differs mutually , and the process which is made to deviate the aim location of a tool to a thick plate side rather than the comparison section , said two plates , aluminum or an aluminium alloy plate , and performs friction churning junction .

[0011] In this invention, since the aim location of a tool is compared, it turns on a thick plate side rather than the section and friction churning junction is performed, frictional heat is supplied to both the plates side almost equally [near the comparison section of the aluminum or the aluminium alloy plate with which thickness differs]. Therefore, it also fully comes to fuse the level difference section on the background of a thick plate, and a positive joint is formed. Therefore, high reinforcement is secured.

[0012]

[Embodiment of the Invention] Hereafter, the junction approach of the difference thickness joint concerning the example of this invention is concretely explained with reference to an attached drawing. Drawing 1 is the sectional view showing the junction approach of the difference thickness joint concerning the example of this invention.

[0013] In this example, the aluminium alloy plate 1 and the aluminium alloy plate 2 are first compared and installed like the conventional approach on the surface plate 3 with which the level difference was prepared. By designing the height of the level difference prepared in the surface plate 3 so that it may be in agreement with the board thickness difference of the aluminium alloy plates 1 and 2, installing the aluminium alloy plate 1 in the level difference bottom, and installing the aluminium alloy plate 2 in the bottom, the front face of the aluminium alloy plates 1 and 2 comes to come to the height of homogeneity, and one flat surface is formed.

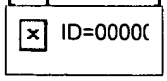
[0014] Subsequently, as the location which shifted from the comparison section of both the aluminium alloy plates 1 and 2 to the aluminium alloy plate 1 side is pressed fit rotating the tool 10 for FSW as an aim location of the pin section 11 and the aluminium alloy plates 1 and 2 are crossed, friction churning junction is performed.

[0015] According to such this example, since the friction surface product of the aluminium alloy plate 1 with thick board thickness and the shoulder section 12 of the tool 10 for FSW becomes larger than the friction surface product of the aluminium alloy plate 2 with thin board thickness, and the shoulder section 12, the calorific value in the aluminium alloy plate 1 becomes larger than it in the aluminium alloy plate 2. Consequently, the aluminium alloy plate 1 will be in a plastic flow condition more mostly, and junction good also with the rear face of an aluminium alloy plate will be performed. Therefore, reinforcement sufficient as a joint can be obtained now.

[0016] In addition, when the diameter of t2 and the pin section 11 is set [spacing of the aim location of the pin section 11, and the comparison section of the aluminium alloy plates 1 and 2 / the thickness of x and the aluminium alloy plate 1] to d for the thickness of t1 and the aluminium alloy plate 2, it is desirable that the following formula 1 is realized.

[0017]

[Equation 1]



[0018] By comparing with an aim location and setting up the spacing x with the section in this way, balance with calorific value and board thickness becomes good between the aluminium alloy plate 1 and 2, and junction by the side of a rear face can be performed now nearly completely.
[0019] In addition, although the jointed member is used as the aluminium alloy plate in the above-mentioned example, it is good also considering an aluminum plate as a jointed member.
[0020]
[Effect of the Invention] As explained in full detail above, according to this invention, frictional heat can be supplied to both the plates side almost equally [near the comparison section of the aluminum or the aluminium alloy plate with which thickness differs]. Therefore, the level difference section on the background of a thick plate can also fully be fused now, can form a positive joint, and can secure high reinforcement.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained in full detail above, according to this invention, frictional heat can be supplied to both the plates side almost equally [near the comparison section of the aluminum or the aluminium alloy plate with which thickness differs]. Therefore, the level difference section on the background of a thick plate can also fully be fused now, can form a positive joint, and can secure high reinforcement.

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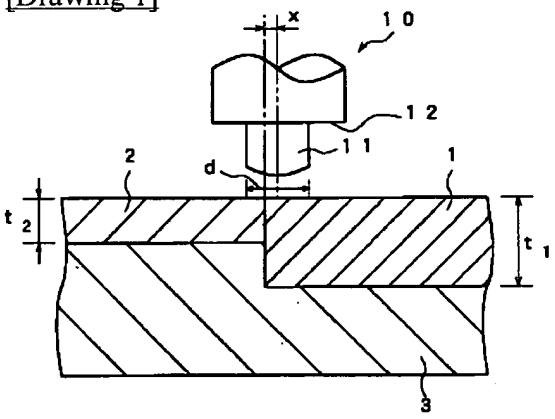
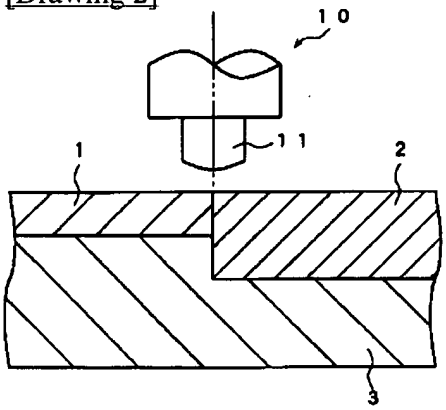
DRAWINGS

[Drawing 1]



[Drawing 2]



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CLAIMS

[Claim(s)]
[Claim 1] The junction approach of the difference thickness joint characterized by having the process which arranges the location of the front face and compares the aluminum or the aluminium alloy plate which is two sheets from which thickness differs mutually, and the process which is made to deviate the aim location of a tool to a thick plate side rather than the comparison section, said two plates, aluminum or an aluminium alloy plate, and performs friction churning junction.

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